U.S. Serial Number: 10/663,566
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AMENDMENTS TO THE CLAIMS

1. (currently amended) A method to determine the organic acid content of petroleum ~~streams~~ crudes, feedstocks or distillation fractions comprising:

(a) heating said petroleum crudes, feedstock or distillation fractions,

~~(a)~~ (b) irradiating a sample of said petroleum ~~stream~~ crudes, feedstocks and distillation fractions with IR radiation;

~~(b)~~ (c) determining an IR absorbance spectrum wherein said IR radiation is only in the spectral ranges having wavelengths 1000-1350 cm^{-1}, 1550-2200 cm^{-1}, 2400-2770 cm^{-1}, and 3420-4800 cm^{-1}; and

~~(c)~~ (d) using ~~correlating~~ all of said wavelengths of said IR absorbance spectrum determined in step (c) ~~(b) with~~ in linear multivariant regression analysis to determine the organic acid content of said petroleum crudes, feedstocks or distillation fractions ~~stream using linear multivariant regression analysis~~.

2. (original) The method of claim 1 wherein said organic acid content is in units of ASTM TAN.

3. (currently amended) The method of claim 1 further comprising the step of heating a sample of said petroleum ~~stream~~ crudes, feedstocks or distillation fractions having boiling points below 1050°F, at a temperature between 25°C and 125°C during said irradiating step.

4. (original) The method of claim 3 wherein said temperature is between 40°C and 100°C.

5. (original) The method of claim 4 wherein said temperature is between 55°C and 75°C.

6. (previously presented) The method of claim 1 wherein the IR absorbance for every spectral frequency is between 0 and 2.0 absorbance units.

7. (previously presented) The method of claim 5 wherein the IR absorbance for every spectral frequency is between 0 and 1.75 absorbance units.

8. (currently amended) The method of claim 3 wherein same sample is a mixture of petroleum ~~streams~~ crudes, feedstocks or distillation fractions having a boiling points below 1050°F.

9. (currently amended) The method of claim 4 wherein said sample is a mixture of petroleum ~~streams~~ crudes, feedstocks or distillation fractions having a boiling point below 1050°F.

10. (original) The method of claim 1 wherein said IR radiation is in the spectral ranges 1000 and 4800 cm^{-1}.

11. (cancelled)

12. (previously presented) The method of claim 1 further comprising the step of orthogonalizing the IR absorbance spectrum so as to eliminate environmental and instrumental contributions.

13. (previously presented) The method of claim 1 further comprising the step of using said IR absorbance spectrum of a set of samples, the calibration samples, which are representative of the variability of petroleum feed and process streams, to develop a prediction regression model having regression factors to predict the TAN of said streams to predetermined accuracy.

14. (previously presented) The method of claim 13 wherein said number of samples is at least 8 times the number of regression factors in the model.

15. (original) The method of claim 13 wherein said samples include both whole crudes and pipestill distillation factions.

16. (previously presented) The method of claim 13 wherein average prediction error for a sample set of whole crude and pipestill and laboratory distillation fractions are less than 0.25.

17. (original) The method of claim 1 utilizing a sufficient number of calibration samples to achieve a predetermined accuracy.

18. (original) The method of claim 17 wherein said number of calibration samples exceed 100.

19. (original) The method of claim 17 wherein said number of calibration samples exceed 400.

20. (currently amended) A method to optimize blending of two or more petroleum ~~feedstreams~~ crudes, feedstocks or distillation fractions or combinations thereof including organic acids having different levels of TAN wherein the feedstream blend is processed into process streams comprising:

(a) heating said petroleum crudes, feedstocks or distillation fractions;

~~(a)~~ (b) blending said petroleum crudes, feedstocks or distillation fractions ~~feedstreams~~ in predetermined proportions to form a feedstream blend;

~~(b)~~ (c) measuring the TAN level of said feedstream blend and/or said processed streams using the method of claim 1;

~~(c)~~ (d) comparing the TAN level of said feedstream blend and/or ~~process streams~~ petroleum crudes, feedstocks or distillation fractions to a predetermined TAN level; and

~~(d)~~ (e) adjusting the proportions of said petroleum crudes, feedstocks or distillation fractions ~~feedstreams~~ in the blending step so that the TAN level of the feedstream blend and/or ~~process streams~~ petroleum crudes, feedstocks or distillation fractions is equal to or less than said predetermined level.

21. (previously presented) In a method for determining the TAN value of a crude oil including organic acid, the improvement which comprises determining the TAN level of the crude oil by the method of claim 1.

22. (currently amended) A method to optimize the addition of organic acid neutralizing agents to a petroleum crudes or feedstocks ~~feedstream~~ that is processed into process streams comprising:

(a) heating said petroleum crude or feedstock;

~~(a)~~ (b) determining the IR absorbance spectrum of the petroleum crudes or feedstocks ~~feedstream~~ and/or processed streams wherein said IR radiation is only in the spectral ranges having wavelengths 1000-1350 cm^{-1}, 1550-2200 cm^{-1}, 2400-2770 cm^{-1}, and 3420-4800 cm^{-1}; and

~~(b)~~ (c) using multivariant regression analysis to determine ~~predicting~~ the organic acid content and/or corrosion of the petroleum crudes or feedstocks ~~feedstream~~ and/or processed streams from all of said wavelengths of said IR spectrum determined in step ~~(a)~~ (b);

~~(c)~~ (d) adding the neutralizing agent in batch or intermittent or continuously mixed flow;

~~(d)~~ (e) measuring the IR spectrum of the treated petroleum crudes or feedstocks ~~feedstream~~ and/or processed streams;

~~(e)~~ (f) predicting the remaining acid content and/or the corrosion rate of the treated petroleum crudes or feedstocks ~~feedstream~~ and/or processed streams without removing the neutralized products or unreacted neutralizing agent; and

~~(f)~~ (g) controlling the amount or blend of neutralizing agents, and/or the temperature, pressure, mixing, or flow conditions in the neutralizing process to achieve the target acid level and/or corrosion rate in the treated petroleum crudes or feedstocks ~~feedstream~~ and/or processed streams.

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23. (currently amended) The method of claim 1 wherein said sample is a mixture of petroleum crudes, feedstocks or distillation fractions ~~streams~~ having a boiling point above 1050°F.

24. (previously presented) The method of claim 13 wherein said number of samples is at least 10 times the number of regression factors in the model.

25. (previously presented) The method of claim 13 wherein said average prediction error for a sample set of whole crude and pipestill and laboratory distillation fractions are less than .15 TAN units.